**Accelerator Systems Division Highlights Ending March 18, 2005**

**ASD/JLAB: Cold Linac**

H-2 cryomodule assembly was shipped to ORNL March 16.

SNS CRYOMODULE CONSTRUCTION IS COMPLETE!

This is the last JLAB weekly report.

**ASD/BNL: Ring**.

SNS documents released this week by Mike Hemmer:

- SNS/BNL Lattice Device Inventory (#105000000-TD0004 R01)
- SNS/BNL Injection Area Installation Notes & Survey Data (#105000000-TD0005 R00)

A summary of in-progress SNS work at BNL includes:

- The K1 extraction kicker magnet assembly (bake out finished this week)
- 17D224 magnet assembly (vacuum chamber fabrication)
- 17ELS224 (magnet measurements and vacuum chamber)
- Lifting fixture for 17ELS224
- 36Q85 quads – assembly underway in AGS high bay area
- Movable scraper assembly for primary collimator
- Diagnostics (BPM, Video Foil Monitor and BIG)
- RTBT Q1/Q2 magnet assembly (mags, stand, vc)
- RTBT QH26 and d/s vacuum chambers
- Coating of several Ring vacuum chambers
- Packing of Ring vacuum chambers, tooling and spares

BNL equipment that is being prepared for shipment:

- 41CDM30 (1) spare
- 7DS300 (2) Injection Dump Septums
- Stand for Injection Dump Septum
- Measuring coils from P. Wanderer
- Six (6) vac clamps, chain type 250
- Eight flags and G-10 blocks for 30Q magnets
- K1 Extraction Kicker Assembly
- Four boxes containing a Dell Xeon PC, and a Dell Power Edge Server (attn. S. Peng).
- Ring vacuum hardware including tooling and spares.
- BIG chamber (with strip lines removed)
- 36Q85 magnet assembly; plan to ship #1 on March 25
- PFN power supply for extraction kickers (prototype)

**Controls**

Jeff Hill, guru of EPICS Channel Access (the EPICS communications protocol), spent the entire week with the SNS controls team giving seminars and leading discussions about future directions for EPICS and Channel Access. In addition, Jeff reviewed the implementation of Channel Access in Java used by the SNS Physics Applications group, and helped several others with implementations and problems. In the process, one or two new “bugs” were uncovered and fixed. Closely related to Jeff’s visit, Susan Hicks of the ORNL IT group delivered a talk on multicasting, and Johnny Tang gave talk on multicasting, inter-PLC communications and the recent control system problem that caused SNS interlock trips, and was eventually solved with a repair to firmware in our CISCO switch. Altogether it was a valuable week for the entire group.

Console structure and benches for the CLO Control Room Southern console arc were received and all planning for installation completed. Installation will start next week.

A new “soft IOC” has been added to keep track of PPS bypasses as EPICS PVs. Bypasses are displayed as yellow borders around the transmitter and modulator icons on the Linac RF Status overview screen. These are soft PVs only – there is no sensor to read the bypass status at the present time. Power supply bypasses will be added later.

PPS Magnet power supply interfaces, Beam Shutdown Stations, and PLC hardware for the remainder of the facility have been ordered. Cabling to the remaining Linac HV modulators, RF transmitters, and magnet power supplies is being installed. PPS interfaces to RF transmitters are being fabricated in the lab. The remote PPS racks for the HEBT have been powered and communication links through the fiber backbone are connected. PLC programs are being generated and plans have been made for installation of remaining field hardware. PPS cabling from the tunnel to the Ring Service Building is being pulled. Decisions on location and number of Ring gates have been made. Design for the Ring Injection Dump control panel is nearly complete. Control strategy meetings for the PPS critical device DH-13 in the RTBT have been held. Rack hardware is being installed in the HEBT/Ring Operator’s PPS rack in the CLO control room.

All equipment associated with the line-synch system has been shipped to from BNL to ORNL except for one complete test system. Documentation and source code for the DSP and FPGA have not yet been checked into CVS.

Bumpless reboot was implemented and tested at BNL for the HEBT and Ring scraper/ collimation systems. At this time, the controls for these systems have been fully tested, and all files checked into CVS at ORNL. Calibrated in units of distance remains to be done. All testing has been at the "engineering" level, with motion controlled in units of motor revolutions, and position readbacks in units of volts from the linear pots. With a looming deadline for shipping the motion hardware, there may not be an opportunity to perform this calibration at BNL.

The Ring LLRF configuration application was successfully demonstrated to work with the test LLRF IOC at ORNL (on the ORNL test network). There is no remaining opportunity for Yury Eidelman to personally hand off this application at ORNL. Updated user (targeting ORNL RF group) and programmer (targeting ORNL controls group) documentation has been checked into CVS. Work on final versions is underway. In addition to this documentation, BNL will continue to provide both user and programmer support via Larry Hoff.

System design for the additional O2 Analyzer on the Klystron Building DI Water System 2 was completed.

The ring injection dump IOC has been set up and files moved from Tullahoma to the accelerator server and installed. The archive request file is ready to load as soon as PVs are generated.

A software review for mercury loop controls (primarily a review of the control screens) was held. Target IOCs are being readied.

In response to recent “surprises” during scheduled (and well announced) power outages, data was gathered and a tool generated to assist with understanding what power panels and circuits power what controls equipment. Data for PPS and CHL will be added shortly.

Primary installation of equipment in the new LEBT Chopper Rack was completed in the HSS, and work began on Remote control of Chopper switches utilizing Beckhoff controller. The prototype LEBT Chopper controller was tested after it was installed in the hot spare in support of upcoming chopper tests. Continued progress was made on the LEBT/MEBT chopper controller.

A clean-up of the Low-Level RF interlocks was completed. Interlocks are now specific to systems, e.g. there are no more nonappliccable RCCS interlocks to override for the SCL, there are a few more checks for HPM initialization inconsistency, timing gate polarities and Phase Lock Loop lock. Implementation will require implementation, and so will await an appropriate opportunity.

**Installation**

Craft Snapshot 3/8/05

| | |
|---|---|
| ASD productive craft workers | **71.0** |
| Foremen (Pd by 15% OH) | 6.0 |
| AMSI management (Pd directly) | 3.0 |
| TOTAL AMSI WORKERS | 79.0 |
| Less WBS 1.9, 1.2 etc | **10.0** |
| Less absent | **3.0** |
| TOTAL PD BY ASD/ORNL DB WPs | **58.0** |

**Accelerator Physics**

Work to model the residual gamma radiation from the target progressed far enough to warrant a presentation on the initial conclusions. This presentation was given on 17/Mar, and there was general consensus among the members of the Radiation Working Group that a gamma blocker is in fact needed for the RTBT beam line. Work is now in progress to refine the model and to arrive at a detailed design.

We've received some quotes for the fiber optics cable and the view screen material needed for the temporary target view screen. We are waiting for one more quote on the fiber optic cable, and then we will be in a position to place the orders.

Updated diagnostics global coordinates for the HEBT are ready to load into the database once some naming issues are resolved

**Operations**

**Ion Source**

The ion source on the hot spare stand is slowly conditioning to higher voltages after the newly assembled lens 2 with new HV connections were installed.

A collaboration of staff from the controls, the diagnostics, the electrical, the mechanical, the physics, and the ion source groups have worked out a detailed plan to test the LEBT chopper on the ion source hot spare stand. This includes a number of challenges due to the intrinsic difference between the front end and the hot spare stand. At first the LEBT chopper will be tested on its readiness for ring commissioning and later on its readiness for 1.4 MW operations.

We have submitted a proposal to Collaborative Research Development Foundation (CRDF). If this proposal gets funded, a team from Sumy, Ukraine, will develop their inverse magnetron volume ion source, trying to match SNS requirements. Besides our Cs-enhanced RF volume ion source, the new Sumy source has the best chances to meet SNS requirements. There is no cost to SNS. The grant would pay the Sumy salaries, their visit to SNS, and our visits to Sumy. The last year’s proposal got good reviews, but was not funded due to a lack of funds

**Survey and Alignment**

S&A final aligned two 8Q35s and the beam pipe on the warm section raft at the top of the ring. From there it was transported to the SCL area of the LINAC where it was final aligned to its ideal position. A second warm section raft was final aligned to its ideal position in the SCL area.

The final sets of 8Q35’s were pre-aligned on three warm section rafts in Magnet Measurement located in the CLO. This completes all pre-alignment of the warm sections in Magnet Measurement.

We have provided the necessary dimensioning for the drilling of the LEDPS stand which will locate the LEDPS components.

S&A final aligned the Upstream Doublet in the RF Straight Section and is proceeding to the Downstream Doublet which should be completed Friday.

RID flange center coordinates, based on the recent tunnel network re-observation, were presented to Mike Plum for further consideration.

S&A aligned the glass guides in the shutter housing for beam line 2. It is now ready for installation into the target monolith.

We have begun our network campaign in the Target Building. Field work began with the re-observation of the South side of the Target Building control network. The first phase covers beam line 2TU, including the integration of the 2TU tank internal network.

There was no S&A Activity in the FES, DTL, CCL, HEBT or RTBT areas during this period.

**Mechanical**

We installed HB07 Warm Section. HB08 and HB11 are assembled and will be moved to the Ring for alignment. MB01 and MB02 are in the front end building. This leaves three more to assemble.

We started mapping the fifth RTBT 21Q.

Ring Systems Installation

- The HEBT arc Ion Pump support brackets' installation was started.
- The Ring Extraction Upstream Doublet Magnet assembly was installed.
- The Ring Extraction straight section Kicker Magnet K2 assy was connected to the Upstream Doublet Magnet Assy.
- The second SCL Warm Section alignment stand was relocated within the Collimator straight section.
- The Collimator Straight Section Closed Loop Cooling System skid was set in position.
- Assembly of the RF Straight Section IPM Support stand was started.
- Alignment of the RF Straight Section lattice components was started.

Water Systems Installation

- Installation of the Linac SCL Cryo Warm Section cooling connections continued.
- Installation of the Linac SCL ME07 cooling systems was completed.
- Installation of the Ring SB PFN cooling system manifolds continued.
- Installation of the Ring tunnel arc magnet cooling connections continued.
- Fabrication of the Ring Collimator Straight Section Collimator Closed loop system was started.
- Installation of the RTBT Service Building PS cooling system continued

**Electrical Group**

Linac Tunnel: Working on cable terminations for SCL modules HB-10, HB-11, and MB-1 and warm section terminations.

Linac Klystron Gallery:
SCL ME-6 area – final cable terminations in progress
SCL ME-7 area - ac power installation, cable terminations in progress
SCL ME-8 area – ac power terminations, diagnostics and vacuum terminations in progress

Ring Building: AC power terminations for RF systems, PPS wiring, and rack installation in progress. Cable tray installation in PFN building completed.

RTBT: AC power and cable tray installation ongoing in the RTBT building.

Completed integrated magnet/power supply/controls testing for SCL warm sections 28 and 29, bringing the completed warm section integrated magnet/power supply/controls tests to 19 of 34.

Completed testing of HEBT_MAG:PS_QH12t18e, HEBT_MAG:PS_QV13t19o, and HEBT_MAG:PS_DH12t18. This beings the number of completed HEBT integrated magnet/power supply/controls tests to 16 of 22. This completes testing in the arc section of the HEBT tunnel.

Repairs continue on the DTL-ME2 switchgear and should be complete today. The SCR for this modulator has been fixed since last week. SCL-ME4 had a problem with the SCR unit operating at near-maximum voltages. We discovered a problem with one channel of the gate firing card, and it has now been repaired. While troubleshooting that unit, we decided to upgrade the snubber board as well. SCL-ME7 is nearly as far as we can take it until the cable installation is complete. Received visitors from KEK this week, and they seemed interested in the modulator technology and asked about setting up a collaboration sometime towards the end of the year. Supported installation of the front end ion source test stand.

**HPRF**

Ring RF

- AC power is about 80% complete.
- DC power connection is about 40% complete.
- Ground plane is complete.
- AC power Breaker panel for the Ring Service Building RF Control room has been installed.

**LLRF**

Installation: The installation of the Field Control Modules (FCMs) and High-Power Protection Modules (HPMs) is complete. Final checkout of the SCL ME-5 systems is in progress and will be completed on March 21. Installation in ME-6 and ME-7 is in progress and will be completed on schedule. With the exception of rack row 33, all Heliax cables have been pulled. We await AC power in rack rows 28, 31 and 33 (cavities 20a – 23d).

Procurements: We have received 30 additional RF Output daughter boards from the vendor. Inspection of the boards is in progress.

Code Development: We will begin deployment of an IOC software upgrade on March 21. This upgrade is driven largely by experience in testing the SCL cavities. Details of the upgrade may be found in the Maintenance Logbook.

Reference System: The RF reference and LO distribution installation, setup and checkout is complete through SCL cavity 18b. The installation, setup, and checkout of the 805 MHz reference line temperature regulation system is complete for the first 12 (of 24 total) temperature zones. Zones 13 - 16 will be completed in the next week or two. Zones 17-18 will follow and will complete the installation required for commissioning of the SCL.

**Cryo Group**

**Beam Diagnostics**

BPM:

- Craig Deibele and Dan Newby have 18 BPMs [12 in HEBT and 6 in SCL] phase-matched and ready for electronics.
- Installed power cords on all BPM IOCs in HEBT
- Installed all BPM cables in the ring
- Barcoded Ring BPMs
- (BNL trip) Ring BPM: added TBT current, calibration to include required numbers for gain to gain calibraiton, tested template with BPM test stand
- BNL to include calibration config and set up for each Ring BPM NAD

BLM:

- FBLM: Boards being built and tested; need to complete boxes
- Sample ion chamber was sent to ORNL to be calibrated to 1000 R/sec. detector is working well to +/-8% from 100 mR/s to 1000 R/sec.
- Started assembling Neutron Detector stands for SCL
- BLM IOC: Start testing

Wires:

- Began WS conversion and Altiris Upgrade
- Begin preparations for test of new design, check amplifier for old systems
- Attended planning meeting for 8, 12 inch actuator design/production. Randy McPherson will be point of contact in Diagnostics group; Tom Roseberry will be point of contact in Mechanical group.
- WS design: not a drop in replacement; keep extra work limited

Laser:

- Laser Wirer: HEBT laser tested/ready; need to organize laser room/cal
- Mode lock laser: Laser installed, RF source ready to install; need to clean up control wiring and install 10Mhz beam ref
- Laser Flipper: 9 installed, spares finished
- Laser Quad Det: Installed 9/8 in test, need to test and set aside as spares
- We are preparing the laser for SCL testing by the end of March. Draft of JHA sent to Sam.
- Replaced covers for Laser Transfer line camera boxes
- Profile Monitor: Added to template, shared with VFM
- Transfer Line Box: first version ready, adding PVs
- Quad testing: setting up laser room, pulse test today/tomorrow (Friday)
- Move VPM to HEBT
- Vibration cancellation: 2 axis
- Ordered parts to finish quad boards

Harp:

- Begin design of electronics box and program
- Harp: CompactRIO tested with switch: Ok

Video Monitors

- (BNL trip) VFM in template format and tested with EPICS client

Timing/Reference:

- The ETS card is going through code testing at present and we are preparing for a low cost, production of 350 pcb, to be installed in April/May, All delivered ETS boards are functioning. Test stand is ready, BIOS problem in SBC, allows only 4 boards to be tested at a time.
- ETC-PCI: Evaluating code is in final test, still in production
- Calibration Mgr: Units calibrated, need to have data entered, barcodes complete and start repairs
- Update FPGA: cores updated, need to upgrade tools
- PCI test stand: verify test operations, need to run through PCI SIG code
- Reworked all timing cards that had missing parts
- Finished and submitted design for new PCI bracket for timing card
- Testing of cards in progress
- Finish higher level functions and test with BPM
- RF ref line: Lasers here/cable installed, designing and adding an EDFA optical amplifier to bring current signals to the ring.

Installation:

- Continued effort in RSB

Software Integration:

- Repaired bad quad for software dev
- Watchdog, Anti-virus software, remote control software
- Working on Motherboard monitoring
- Setup for test of modular version
- Ch0: bought multimedia boxes
- VPN: still turned off. Wim cannot access many systems
- PV Gateway crashed from time to time> Ch13/0 down
- Platform: finalizing version 2/Advanced cloning, test SCC, test Cloning

Configuration:

- Continue with SP2 image and specifically testing of patching
- Account for needed PCI cards
- Addressing renaming of Devices
- Expediting shipment of PCs from GT Web; specified Intel motherboard is not available.
- Ordered 2 CCR and 2 SDA Workstations; shared cost with controls.

General:

- Device Activity Tracking (Percent Complete for new milestones.)
- Database work
- Continued with Manufacturer/model breakdown for effort of the web access to documentation
- Ring Cables specifically BIG, VFM, Harp, IPM, EC
- EDM Screen  Modifications